



## **Controlling factors in fish early life history and how they combine to influence trophic links across the North Atlantic Ocean.**

**Neuheimer, Anna; Payne, Mark; MacKenzie, Brian**

*Publication date:*  
2015

*Document Version*  
Publisher's PDF, also known as Version of record

[Link back to DTU Orbit](#)

*Citation (APA):*  
Neuheimer, A., Payne, M., & MacKenzie, B. (2015). *Controlling factors in fish early life history and how they combine to influence trophic links across the North Atlantic Ocean..* Abstract from ICES Annual Science Conference 2015, Copenhagen, Denmark.

---

### **General rights**

Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

- Users may download and print one copy of any publication from the public portal for the purpose of private study or research.
- You may not further distribute the material or use it for any profit-making activity or commercial gain
- You may freely distribute the URL identifying the publication in the public portal

If you believe that this document breaches copyright please contact us providing details, and we will remove access to the work immediately and investigate your claim.

**Controlling factors in fish early life history and how they combine to influence trophic links across the North Atlantic Ocean.**

*Anna B. Neuheimer<sup>1</sup>, Mark R. Payne<sup>2</sup> and Brian R. MacKenzie<sup>2,3</sup>*

*<sup>1</sup>University of Hawai'i at Mānoa, Honolulu, HI, USA. Email: abneuheimer@gmail.com*

*<sup>2</sup>Centre for Ocean Life, DTU-Aqua, Charlottenlund, Denmark*

*<sup>3</sup>National Institute for Aquatic Resources, Technical University of Denmark (DTU-Aqua), Charlottenlund, Denmark*

The transfer of energy through an ecosystem is shaped by the overlap of predator and prey distributions in both space and time. Here, we identify the plastic vs. adaptive factors controlling timing of Atlantic cod (*Gadus morhua*) early life stages and how these factors combine to shape the overlap between first-feeding cod and their zooplankton prey. Atlantic cod populations exhibit remarkably similar life histories despite spanning wide ranges in latitude (40 to 80°N) and climate (e.g. -1 to 20°C). In previous work, we demonstrated that temperature-standardized spawning time (i.e. the thermal constant of spawning) shows systematic and parallel declines with increasing latitude for populations on both sides of the Atlantic (Neuheimer & MacKenzie, 2014, *Ecology*. 95:3364-3375). Here we explore these patterns as evidence of adaptation (i.e. countergradient variation) to growing season timing by comparing estimates of first-feeder- and prey-timing proxies for populations across the species' range. We discuss how adaptive vs. plastic factors combine to shape energy transfer from lower trophic levels, and how these trophic links may change in the future.